The study of X-ray galaxy clusters and its cosmological applications

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Abstract

Galaxy clusters are the largest gravitational bounded system in the Universe. The X−ray band (0.5−10 keV) is a unique observational window, since it allows us to study their hot intracluster medium (ICM) which constitutes the large majority of the cluster baryons and it reflects the cluster dynamical equilibrium in its morphology and thermodynamical properties.

I built a mock cluster catalog with redshift, X−ray luminosity and ICM temperature based on observed scaling relations between total mass, ICM temperature and total X−ray luminosity. Thanks to this work, we are able to predict the scientific impact of the next generation X−ray satellites such as the WFXT for different sets of observing strategies.

A major problem with future X−ray surveys of this kind, which are expected to discover hundred thousands of new groups and clusters, is the measurement of redshifts. An interesting possibility is the measurement of the X−ray redshift directly from the X−ray data, thanks to the identification of the Iron Kα emission line complex.

With more detailed cluster structure analyses, we can combine the observation of strong lensing, X−ray gas fraction and Sunyaev–Zel'dovich effect to give an independent cosmological constrain. We collect a new sample of 10 lensing galaxy from strong gravitational lensing systems which have both X−ray observations and optical giant luminous arcs with known redshift. By combining them we can get reasonable fitting values of basic cosmological parameters.